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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/846,272	05/02/2001	Masaki Watanabe	50090-295	6124

7590 07/13/2004

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Washington, DC 20005-3096

EXAMINER

SARKAR, ASOK K

ART UNIT	PAPER NUMBER
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2829

DATE MAILED: 07/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/846,272

Applicant(s)

WATANABE ET AL.

Examiner

Asok K. Sarkar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2,3 and 16-20 is/are pending in the application.
- 4a) Of the above claim(s) 4,6,7 and 9 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3 and 17-20 is/are allowed.
- 6) ☒ Claim(s) 2 and 16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments in pages 6 – 9 under the heading "Claim Rejections Under 35 U. S. C. 35 USC § 103", filed June 25, 2004, with respect to claims 2 and 16 have been fully considered and are persuasive. The rejection of April 28, 2004 has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

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under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 2 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ference, US 6,225,699 or McCormick, US 6,369,448 or Lin, US 2003/0205826 in view of McKee, US 6,418,029.

Regarding claim 2, Ference, McCormick or Lin teaches a semiconductor device comprising:

- a BGA substrate having one principal plane furnished with large number of solder balls;
 - a first semiconductor chip having a first side and an opposite side, said first semiconductor chip including bumps and active regions formed on the first side said first semiconductor chip being attached to another principal plane of said BGA substrate through the bumps; and
- a second chip attached to the active regions of said first semiconductor chip, wherein a thickness of the chip is less than a thickness of the bumps (see Ference, Fig. 1; McCormick, Figs. 1 and 4 and Lin Figs. 3D and 3E).

Ference, McCormick or Lin teaches chip on chip designs for improved and efficient interconnections, but fails to teach a chip capacitor attached to the active region of the semiconductor chip wherein the thickness of the chip capacitor is less than the thickness of the bump.

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McKee teaches a semiconductor device in which chip capacitor 50, wherein the thickness of the chip capacitor (decoupling capacitor in column 2, lines 46 – 48) is less than the thickness of the bump 40 (see Fig. 2 and associated discussion in column 3, lines 16 – 67) is placed near the active region of the semiconductor chip for the benefit of shortening the interconnection distance thereby lowering inductance in column 2, lines 55 – 58.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Ference, McCormick or Lin's device and attach a chip capacitor to the active region of the semiconductor chip to act as a decoupling capacitor wherein the thickness of the chip capacitor is less than the thickness of the bump for the benefit of shortening the interconnection distance thereby lowering inductance as taught by McKee in column 2, lines 55 – 58

Regarding claim 16, limitations of this claim were discussed earlier in rejecting claim 2.

Allowable Subject Matter

5. Claims 3 and 17 – 20 are allowed.
6. The following is an examiner's statement of reasons for allowance:

Claims 3 and 17 – 20 recites, inter alia, a semiconductor device comprising a chip capacitor attached to the opposite side of a semiconductor chip attached to a BGA substrate wherein the semiconductor chip includes vias extending from the active region to the opposite side for connecting the chip capacitor through the via. The art of record does not disclose or anticipate the above limitation in combination with other claim

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elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 571 272 1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

8. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Asok K. Sarkar
July 12, 2004

Patent Examiner